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courses equally valuable. It cannot be too often repeated that only the incompetent slavishly follow courses prescribed by other teachers. Each really good teacher is obliged to make his own in details, though he may follow another's general plan.

The book certainly does not overshoot its audience. One who is familiar with the teaching of botany in schools of the upper Mississippi valley and westward is tempted to think that Professor LLOYD'S ideal has already been realized and perhaps even surpassed in a considerable number of the better high schools; and he wonders whether the book is not better adapted to the teachers and schools of the North Atlantic states, which, in the teaching of science, have certainly lagged behind the less conservative western ones.

It would be of no service to attempt to summarize the author's discussions, which will well repay serious consideration, and should be read both by the college man and the secondary teacher.—C. R. B.

### A monograph on transpiration.

THE ABSOLUTE necessity that the investigator be thoroughly cognizant of what others have done and thought in his field, together with the ever-increasing hopelessness of coping with this task, offer probably the most serious discouragement to the scientific man. This difficulty, however, can be very much lessened by the publication from time to time of exhaustive monographs in restricted fields. A number of such monographs have of late years been appearing in plant physiology, the last to come to hand being BURGERSTEIN'S excellent summary of the whole subject of transpiration,[2] a subject whose literature has been extraordinarily difficult to compass. The book is a natural growth from the author's three previous bibliographical and critical papers on this subject, *Materialien zu einer Monographie betreffend die Erscheinungen der Transpiration der Pflanzen*, which appeared from 1887 to 1901, but it is much more than a bringing of these up to date; it is not a mere critical bibliography but a thorough treatise on the various phases of the subject. New experimental data are scattered through the work, being presented in connection with the discussion of the several questions involved. Besides true transpiration, we have also discussed here the allied phenomenon, guttation, in a chapter which is altogether the best treatment that this subject has yet received. A very complete bibliography occupies thirty-three pages at the end of the volume, a bibliography in which reviews are uniformly noted as well as the articles themselves.

The subject-matter is divided logically into thirty chapters, each of which deals with a certain part of the general field. The headings of some of these are as follows: Methods of investigation, Light in general, Light rays of certain refrangibility, Atmospheric carbon dioxid, Air temperature, Humidity, Air movements, Chemicals, Periodicity, Guttation, etc. The language is clear and concise and the matter so well arranged that the reader has little trouble in finding the discussion of any particular point in which he may be interested. Different readers will doubtless differ as to the relative importance of the several subjects, but it seems on the whole that the balance is well preserved. All workers in plant physiology will find the work practically indispensable. The only source of regret is that so many minor typographical errors should have escaped the proof reader.—B. E. LIVINGSTON.

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[2] BURGERSTEIN, ALFRED, Die Transpiration der Pflanzen. Imp. 8vo. pp. x+283, *figs. 24.* Jena: Gustav Fischer. 1904. *M* 7.50.

## NOTES FOR STUDENTS.

AMONG THE MOST important ecological investigations of late years are those that have been carried on in New Zealand by COCKAYNE, which have recently brought him the degree of Ph.D., *causa honoris*, from the University of Munich. His most recent publication is an ecological presentation of the flora of the famous "southern islands."[3] COCKAYNE had the privileges of a government steamer, and was able to visit Auckland, Campbell, Antipodes, and Bounty Islands. Although it was necessary to make his studies with "feverish haste," his was the first ecological trip ever made to these islands, and the first botanical trip in winter. These islands lie between lat. 47° 43′ and 54° 44′ S., yet in spite of the high latitude, the larger islands are clothed with a luxuriant rain-forest. Auckland Island (50° 45′) rarely has snow for over three days at a time on the lowlands. Although the rainfall is not excessive, almost every day is rainy or at least cloudy and the evaporation is slight. These features, together with the mild winters, make an ideal rain-forest (hygrophytic) climate. However the winds are constant and violent, a feature which commonly accompanies a xerophytic climate. The resultant vegetation reflects the peculiar climate to a most extraordinary degree. The forest trees are short (not exceeding five meters in height), and present the gnarled aspect so familiar in mountain regions and near the sea. The lateral branches grow to such length as to make the forest a true jungle. Within the forest, where the air and the forest floor are always moist, the wind does not enter; hence the vegetation is amazingly luxuriant, reminding one of the tropical forests; mosses, liverworts, and filmy ferns grow in wild profusion, making a soft carpet, while the trunks of the trees are covered with epiphytes. Even a tree fern (Hemitelia) was discovered, extending by some degrees the record for this ecological type. On Auckland Island there is found a typical hygrophytic forest, though with a xerophytic physiognomy such as just described; Campbell Island has merely a scrub; while Macquarie Island is without either forest or scrub. All of these islands have essentially similar climates, but the smaller islands are too exposed for trees, having instead the tussock formation. The dominant tree of these hygrophytic rata forests is the myrtaceous *Metrosideros lucida*. The much more local forests, in which *Olearia Lyallii* dominates, have a somewhat different aspect. An interesting formation, found also in the Falk-

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[3] COCKAYNE, L., A botanical excursion during midwinter to the southern islands of New Zealand. Trans. N. Z. Inst. **36**:225–333. 1904.